

TECHNOLOGICAL DUALISM, AGRICULTURE AND THE UNEMPLOYMENT PROBLEM OF DEVELOPING ECONOMIES

Egbe B. E ¹, Ogar A. M ², Ibrahim M.K ³ and Albert, A. T⁴

^{1,2,3}Department of Agricultural Economics, University of Nigeria, Nsukka, ⁴Department of Political Science, Federal Polytechnic, Kaduna

ABSTRACT

Developing countries are likely to be subjected to greater and greater technological dualism and the importation of modern efficient and large scale technologies is expected to exacerbate the dualistic problem, create unemployment, and lead to greater inequality in income distribution". This paper provides hypothetical analyses of the preceding assertion. After an introduction highlighting the dualistic problem, the paper provides theoretical and analytical views of technological dualism. Using hypothetical scenario, critical analyses of the effects of technological dualism on agricultural productivity and employment generation were given. Conclusion and recommendations were made for development planning.

KEYWORDS: Technology, unemployment, productivity, importation, inequality, income.

INTRODUCTION

One important feature of technology is its use for creating wealth in an economy. This very important feature of technology may be visible in the industrial or urban sector but relatively not seen in the agricultural or rural sectors of developing countries. There exists significant difference in the level of technology used in the industrial and the agricultural sectors. The industries employ modern technology known for high efficiency of production and large outputs per time. On the contrary, developing economies agriculture (predominantly subsistence) is dominated by traditional technology characterized by high labour intensity and low productivity in terms of input – output relationships. The differentiation in the industrial and agricultural sectors in terms of technology generates what Wolgin (1978) called the "dualistic problem". He stated that "developing countries are likely to be subjected to greater and greater technological dualism and the importation of modern efficient and large scale technologies is expected to exacerbate the dualistic problem, create unemployment, and lead to greater inequality in income distribution". This paper provides hypothetical analyses of the situation in Wolgin's assertion.

TECHNOLOGICAL DUALISM: THEORETICAL/ANALYTICAL INTERPRETATION

Technological dualism is a subset of a broader economic concept, dualism. In general, technological dualism is defined as coexistence of two differentiated sectors within an economy, the differentiation being in the technology used. The two sectors may be viewed as the industrial and agricultural sectors, commercial and subsistence sectors or urban and rural sectors. Several analytical views to technological dualism exist in literature. Ghandour and Muller (1977) identified two approaches, and they developed a new approach included here as the third approach.

- i) The surplus labour/agricultural surplus absorption approach. This approach is centered on the fact that the process of development involves the extraction and disposition of surplus labour and/or agricultural surplus from the agricultural sector. The dualistic structure is seen by an asymmetry in the production function. That is, the industrial sector uses reproducible capital and labour to produce its products, and the agricultural sector does not utilize any reproducible capital. This is due to the different capital intensities of the production process for each of the two commodities and the relative expensiveness of capital and cheapness of labour. This approach is associated with economists such as L.A. Lewis, J.C. Fei, G. Ranis, Richard D. Jorgenson, and C. Wharton.
- ii) Factor Market Imperfection Approach: Technological dualism is viewed as the utilization of two different techniques in producing the same commodity, which must be due to the distortions in the factor markets such that different entrepreneurs face the same production function. This approach was first used by M. Myint.
- iii) Two Production Functions Approach: Technological dualism viewed here as the existence of two production functions for the same commodity facing the respective sectoral entrepreneurs (Meier, 1995). The two entrepreneurs are assumed to face differing endowments of non conventional inputs such as

Table 1: The Different Non Conventional Inputs available to the Subsistent and Commercial Sectors Entrepreneurs.

Endowments of Subsistent Sector Entrepreneur (or Farmer)	Endowments of Commercial Sector Entrepreneur (or Farmer)
Low level of technological sophistication	A level of technological sophistication involving familiarity with the ability to work with modern inputs and methods
Possess inadequate managerial skills and aptitude.	Possess adequate managerial skills and aptitude, capable of working in a complex economic system with relatively high level of specialization.
Possess social values of pre-industrial societies.	Possess socio-economic attitudes towards risks, profit maximization and types of labour relationship.
Cultural patterns are archaic and do not respond rapidly to change.	Cultural pattern are influenced by exposure to advanced societies.

Adopted from Ghandour and Muller (1977).

Different endowments of non conventional inputs avail different levels of technology (Table 2) to the different sectoral entrepreneurs.

Table 2. The Different Technologies adopted in Subsistent and Commercial Sectors.

Description	Technology used in Subsistent Sector	Technology used in Commercial Sector
Tools	Simple: fire hoe, axe, digging sticks, machetes	Complex: tractors and implements, threshers
Crops	Many species (5-80) landraces, no genetic improvements, wide genetic base	Few species (1-3) improved genetic base
Animals	Several species	Usually 1 or 2 species
Labour	Manual, human energy or animal power	Mechanical, petroleum fuels, electrical energy
Soil fertility maintenance	Fallows, ash, organic manures	Inorganic fertilizers, sometimes manures, soil amendments e.g. lime, etc
Crop management	Manual	Growth regulators for defoliation, control of flowering and fruit drop, etc
Pest and disease control	Physical and cultural	Mainly Mechanicals and chemicals (insecticides, fungicides, etc)
Harvesting	Manual or with simple tools	Mechanical: tractor and implements including threshers and combine harvesters.
Post harvest handling and drying	Simple sun – drying or over fire.	Mechanical forced air, artificial drying using petroleum fuels and sometimes refrigeration.

Adopted from Okigbo (1988) in: Asoegwu and Asoegwu (2007).

managerial/organizational skills, levels of technological know-how, information and social attitudes (Ghandour and Muller, 1977).

TECHNOLOGICAL DUALISM AND AGRICULTURE

As in most dualistic structure, if the agricultural sector production processes are characterized by labour intensive techniques and variable technical coefficients of production, while the production processes in the industrial sector are capital intensive and possess relatively fixed technical coefficients, the technology of the industrial sector may impede growth in the agricultural sector (Thirlwall, 2003). Relatively fixed technical coefficients (i.e. low elasticity of factor – factor substitution) means that labour can be absorbed into the industrial sector only as fast as capital growth. Secondly, high capital intensity will restrict employment opportunities in the industrial sector. Agriculture will have to absorb more labour, while land remains relatively fixed. Hence, agricultural productivity will be slowed down because at the long run all available land becomes cultivated by highly labour intensive techniques. Marginal productivity of labour falls to a low level (Meier, 1995). It is argued that in the long run, technological progress in the industrial sector will not ease the situation. It will favour more capital intensive techniques, so that it will all the more be difficult to employ more labour as investments and outputs expand.

From the perspective of two production functions approach, technological dualism gives no better implication for agriculture. Two entrepreneurs gave their different endowments of non conventional inputs (Table 1) produce the same farm produce at different production functions.

Adoption of different level of technologies makes the commercial sector entrepreneur to produce same commodity at a higher production function than the subsistent sector entrepreneur. Improvement in the subsistent farmer's technology will only cause his output to increase along his prevailing production function. He can only produce at the same level as his commercial counterpart in the long run when his endowments of non conventional inputs must have changed positively, which requires a very piecewise process. The short term implication is that aggregate agricultural outputs remain low (at lower production function than those of commercial sector entrepreneur) since majority of farmers in developing economies are in the subsistent sector. If not checked the low productivity is sustained in the long term.

Technological Dualism and Unemployment Problem

Several development economists have suggested that the unemployment problem of developing economies is due to the existence of technological dualism. They observed that technological dualism is associated with structural or technological unemployment (Thirlwall, 2003), a situation in which employment is limited, not due to lack of effective demand, but due to resource and technological constraints in two sectors. Using the graphical illustration (fig. 1) of Meier (1995) the unemployment situation caused by these technological constraints can be explained. Points a, b, c, etc represent the fixed combination of factors; capital (k) and labour (L) that would be needed to produce the outputs Q1, Q2, Q3, etc, irrespective of what the relative factor prices were. The line OE, joining the points a, b, c, etc represents the expansion path of this sector (industrial sector), and its slope is equal to a fixed value (relative capital intensive factor ratio). Only when capital and labour are actually available in the proportions equal to the fixed capital labour ratio is it possible that both factors can be fully utilized simultaneously. If the actual factor endowments is to the right of the line OE say, at point F, there must be some employment of labour in this sector. To produce an output of Q1 the sector will use OK1 units of capital and OL1 units of labour, even though OL2 units of labour are available. The excess supply of labour will have no effect on production techniques, L1L2 units of labour will remain in excess supply, regardless of the relative factor prices of capital and labour. The excess labour will be employed only if capital stock were to increase in the amount indicated by the line FF1. Where technological dualism is due to foreign enclave, a large proportion of industrial savings which would have been invested in capital expansion are remitted to their home country, leading to insufficient accumulation of capital. This causes the excess labour to remain unemployed or seek employment in the agricultural sector.

CONCLUSION AND RECOMMENDATIONS

Although technological dualism is an inevitable attribute of development process, it impedes agricultural growth rates and the employment prospects in developing economies. For a sustained economic growth these challenges must be checked through proper development planning. The checks must be two sector based just as technological dualism itself. First, in the industrial sector, the economic planners would need to find out what and how benefits

will be shared between the sectors before an industrial development plan is adopted. They should maximize reinvestment potential of any industry, economize on scarce foreign exchange, maximize the backward and forward linkages of any industry and emphasize employment generation. Second, in the agricultural sector, a piecewise process of transformation is required. Early in the process, appropriate – intermediate technology (in factors and methods) that can be easily adopted by the agricultural sector (subsistent sector) should be introduced. This technology is employment generating rather than underemployment or unemployment stimulating (Olayide, 1980). Moreover, the agricultural sector entrepreneurs should be provided access to extension services as well as credit facilities. This will facilitate the adoption of appropriate – intermediate technology and thereby boost agricultural productivity.

REFERENCES

- Asoegwu, S. and Asoegwu, A. (2007). An Overview of Agricultural Mechanisation and its Environmental Management in Nigeria. *Agricultural Engineering International: the CIGR E Journal Invited Overview*. 6 (8).
- Ghandour, M. and Muller, J. (1977). A New Approach to Technological Dualism. *Economic Development and Cultural Change*. University of Chicago Press. 25(4): 629 – 637.
- Meier, G.M. (1995). *Leading Issues in Economic Development* (6th Ed). Oxford University Press, New York.
- Olayide, S.O. (1980). Agricultural Technology and the Nigerian Small Farmers. *The Nigerian Small Farmers: Problems and Prospects in Integrated Rural Development*. Centre for Agriculture and Rural Development (CARD), Ibadan, Nigeria. Pp.52 – 65.
- Thirlwall, A.P. (2003). *Growth and Development: With Special Reference to Developing Countries*. Palgrave Macmillan, New York, U.S.A.
- Wolgin, J.M. (1978). Manufacturing Industry in Nigeria's Third Development Plan. *Journal of Modern African Studies*. Cambridge University Press. 16 (4): 687 – 693.

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Corresponding Author:

Ibrahim M.K

Department of Agricultural Economics, University of Nigeria, Nsukka

email: kebitex@yahoo.co.uk